federal register

WEDNESDAY, OCTOBER 10, 1973
WASHINGTON, D.C.

Volume 38 ■ Number 195

PART IV

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

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PROPELLER DRIVEN SMALL AIRPLANES

Proposed Noise Standards

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

[14 CFR Parts 21, 36]

[Docket No. 13243; Notice No. 73-26]

PROPELLER DRIVEN SMALL AIRPLANES

Noise Standards

The Federal Aviation Administration is considering amending Part 36 of the Federal Aviation regulations to prescribe noise standards for the issue of normal, utility, acrobatic, transport, and restricted category type certificates for propeller driven small airplanes; to prescribe noise standards for the issue of standard airworthiness certificates and restricted category airworthiness certificates for newly produced propeller driven small airplanes of older type designs; and to prohibit "acoustical changes," in the type design of those airplanes, that increase their noise levels. Related changes to the certification procedures of Part 21 of the Federal Aivation regulations are also proposed. Certain of these changes would apply to all airplanes covered by Part 36.

Interested persons are invited to participate in the making of the proposed rules by submitting such written data, views, or arguments as they may desire. Communications should identify the docket number and be submitted in duplicate to the Federal Aviation Administration, Office of the General Counsel, Attention: Rules Docket AGC-24, 800 Independence Avenue SW., Washington, D.C. 20591. Comments on the overall environmental aspects of the proposed rules are specifically invited. All communications received on or before December 14, 1973, will be considered by the Administrator before taking action upon the proposed rules. The proposals contained in this notice may be changed in the light of comments received. All comments will be available, both before and after the closing date for comments, in the Rules Docket for examination by interested persons.

I. *General background.* Part 36, "Noise Standards: Aircraft Type Certification," was issued on November 3, 1969, and published in the FEDERAL REGISTER (34 FR 18355) on November 18, 1969. That part contains noise measurement, noise evaluation, and limiting noise level requirements for the type certification of turbojet airplanes and transport category airplanes. Those standards and procedures are necessarily complex in order to effectively describe and control the high noise levels of large airplanes and airplanes powered by turbojet engines. It is now proposed to add, to Part 36, simplified noise standards, and simplified procedures for measuring noise and correcting noise data, for propeller driven small airplanes in the normal, utility, acrobatic, transport, and restricted categories. The proposed requirements would be contained in new Subpart F and new Appendix F of Part 36, with supporting procedural provisions in Part 21.

The proposed standards and procedures are believed to be adequate to define and control the noise of the aircraft covered by this Notice (hereafter referred to as "propeller driven small airplanes") even though the complexity of the proposed standards has been greatly reduced (when compared with the procedures now in Part 36 for large airplanes and for jet powered airplanes) commensurate with the relatively low noise levels of propeller driven small airplanes and the relatively small economic base, in the segment of the aviation community that manufactures propeller driven small airplanes, that is available to support the costs of noise compliance testing in addition to the other costs of type and airworthiness certification. Standards similar to those proposed herein were recommended by the U.S. to ICAO Working Group C and were adopted, in March, 1973, by that working group as a recommended practice.

The factors considered by the FAA in selecting the noise standards and procedures in this proposal included (1) the above mentioned simplicity of the procedures; (2) the ability of the procedures to produce consistent and reproducible results over the range of ambient test conditions expected in practice; (3) the similarity of the flight procedures to the kinds of flyovers that have resulted in noise complaints involving small airplanes; (4) the ability of the selected procedures to result in noise levels significantly less than the noise levels of most currently existing propeller driven small airplanes; and (5) the expected economically reasonable impact of the specified noise levels on the manufacturers of propeller driven small airplanes.

II. *Selection of the sound measurement unit.* As further discussed below, proposed Appendix F of Part 36 would accomplish, in a simplified manner for propeller driven small airplanes, noise measurement and correction functions that are now accomplished, for transport category and turbojet powered airplanes, by Appendix A of Part 36. A primary difference between Appendix F and Appendix A is the selection of dB(A) as the sound measurement unit (rather than EPNdB which is used in Appendix A). The value of dB(A) as the noise evaluation measurement unit for propeller driven small airplanes became evident upon review of available alternative units of sound measurement. Data recorded during tests of several propeller driven small aircraft were reduced to EPNdB, PNdB, dB(A), and dB(D) for comparison to aid in choosing the most appropriate unit. The dominant frequencies for these aircraft are normally below 1000 Hz; therefore, the use of units that apply a large weighting to the higher frequencies (EPNdB, PNdB, and dB(D)) is unnecessary and may introduce measurement and analysis errors. The tone correction in EPNdB does not contribute significantly to the analysis of propeller driven small airplanes although it is believed the correction for low frequency tones may add about ½–1 EPNdB. The lack of a direct readout and the cost of analysis indicate that the use of EPNL would create an unwarranted burden on the manufacturer with no apparent benefit (except to be consistent with FAR 36 and ICAO Annex 16 to allow direct correlation between propeller driven and turbojet engine powered airplanes).

A review of existing literature reveals that dB(A) has been selected by the Department of Labor and the Department of Health, Education and Welfare for the critical task of rating and limiting noise hazards. The value of dB(A) is stressed in the document entitled "Criteria for a Recommended Standard for Occupational Exposure to Noise" published by HEW in 1972. That report states that:

> As a result of its simplicity and accuracy in rating hazard to hearing, the A-weighted sound level was adopted as the measure for assessing noise exposure by the American Conference of Governmental Industrial Hygienists (ACGIH) and by an Intersociety Committee consisting of representatives from the American Academy of Occupational Medicine, American Academy of Ophthalmology and Otolaryngology, ACGIH, Industrial Hygiene Association, and the Industrial Medical Association. A-weighted sound level measurement was also adopted by the U.S. Department of Labor as part of the Occupational Safety and Health Standards and by the British Occupational Hygiene Society in its Hygiene Standard for Wide-Band Noise.
>
> In keeping with the several precedents which have been established for its use in rating the hazard resulting from industrial noise exposure, and because it has been shown to be a reasonably accurate measure of such hazard, the A-weighted sound level measurement has been recommended for use in rating noise hazards in the Recommended Standard.

In addition, studies such as NASA's "Community Reaction to Airport Noise" stress the fact that "simple weighted sound pressure level values (dB(A) and dB(N)) provide adequate approximations to more complex measures for the purpose of determining community noise exposure."

Although a tape recording must be made, the selection of dB(A) ensures that reasonably priced meters can give an immediate reading upon which to base a decision for additional tests. If this decision can be made while aircraft are available and test conditions are established, savings in cost and time are possible. Finally, dB(A) is the unit used in evaluating other transportation noise sources, and is used in setting noise limits for many industrial and nonindustrial noises. In summary, there appears to be no overriding reason to use more complex measures.

III. *The proposed amendments to Part 36 (except Appendix F).* Section 36.1 would be amended to broaden the applicability of Part 36 to include propeller driven small airplanes, to include specific reference to airworthiness certificates (in addition to type certificates), and to designate the specific subparts that apply to each kind of certificate and class of airplane. Note that new § 36.1(b)(2) would

be marked "reserved." That subparagraph will eventually contain any applicability provisions that may be issued following Notice 72-19, "newly produced airplanes of older type designs," published in the FEDERAL REGISTER (37 FR 14813) on July 25, 1972.

Proposed new § 36.1(b)(3) expands Part 36 to cover propeller driven small airplanes.

It should be noted that proposed § 36.1 (b)(1) and (b)(3) would split the transport category into two parts—large and small airplanes—for the purpose of determining which noise standards apply. Large transport category airplanes, like all turbojet powered airplanes, would, because of their high noise levels, continue to be subject to the complex procedures and standards currently in Part 36. Transport category propeller driven small airplanes, like other propeller driven small airplanes, would be subject to the simpler procedures and lower noise levels of proposed new Subpart F and Appendix F. This aspect of the proposed amendment of Part 36 reflects the effect of Amendment 23-10 to Part 23, Airworthiness Standards: Normal, Utility, and Acrobatic Category Airplanes. That amendment to Part 23 (published in the FEDERAL REGISTER (36 FR 2863) on February 11, 1971), which was issued after Part 36 was issued, limits the availability of type certification under Part 23 to small airplanes that have a seating configuration, excluding pilot seats, of nine seats or less. This means that the transport category provisions of Part 25 must be used for small airplanes with higher seating configurations. This may result in increasing requests for type certification of propeller driven small airplanes in the transport category. The FAA does not believe that these airplanes should be subject to standards different from those applicable to other propeller driven small airplanes. As mentioned above, turbojet powered airplanes, small or large, are not affected by this proposal and must continue to meet currently effective Part 36 whether or not they are in the transport category. Finally, the FAA believes that the regulatory dividing weight between large and small airplanes (i.e. 12,500 lbs. maximum certificated takeoff weight) is a valid criterion for distinguishing between those heavy and relatively noise airplanes that require the complex noise measurement and evaluation procedures of current Part 36, and those lighter, quieter airplanes whose less annoying noise characteristics do not justify imposition of standards and procedures as complex as those now in Part 36.

Section 36.1(c) would be amended to extend the concept of the "acoustical change" provisions of Part 36 to the propeller driven small airplanes covered by Part 36. Under this concept, airplanes that are noisier than the prescribed noise limits may not be modified in a manner that makes them any noisier, and airplanes that are within prescribed noise limits may not be modified in a manner that causes them to exceed those limits. The acoustical change concept is based on two premises: First, in addition to the strong public interest in stopping noise escalation, it would be highly misleading to the public to purport to restrict aircraft noise to specified levels at the design and manufacturing stage and then permit the same aircraft to be modified later so as to nullify the benefits of such acoustical design provisions; and, second, it would be unfair to the manufacturer to require him to demonstrate compliance with specific noise levels while at the same time permitting noise escalation through aircraft modification, and particularly while permitting that same product to be later modified by others (such as by an applicant for a supplemental type certificate) to increase its noise levels. Unlike the "acoustical change" requirements currently applicable to transport category and turbojet engine powered airplanes, this proposal would limit the "acoustical change" concept, for propeller driven small airplanes, to type design changes specifically involving either (i) change to, or removal of, a muffler or other component designed for noise control, and (ii) change to, or installation of, a powerplant or propeller that increases maximum continuous power or thrust, or increases propeller tipspeed at that power or thrust, over that previously approved for the airplane. The difference from the broad acoustical change provisions now in effect is believed to be justified by (1) the remote probability that type design changes other than the two that are specified would cause any increase in noise under the noise measurement conditions prescribed in proposed new Appendix F, and (2) the importance of eliminating unnecessary complexities from the regulation (consistent with the need to prevent noise escalation), because of the relative lack of broad and sophisticated noise prediction, evaluation, and control expertise among modifiers of small airplanes. If it is determined that particular classes of type design change other than those proposed herein may cause noise increases under the conditions specified in Appendix F, those classes will be specifically identified in future proposed rule making. It should be noted that the listing of specific type design changes as "acoustical changes" is not a finding that such type design changes will, in fact, increase noise levels, but is only a finding that a possibility of noise increase exists and that evaluation under Part 36 is necessary to ensure that no noise increase over allowable limits exists as a result of the type design change. Finally, it should be noted that agricultural and fire fighting airplanes would be excluded from the acoustical change rules if they have been issued the operating limitation prescribed in § 36.1583(c) (see below discussion of agricultural and fire fighting airplanes with respect to proposed § 36.501(c)).

Proposed new Subpart F, entitled "Noise Limits: Propeller Driven Small Airplanes," would contain the basic noise requirements for propeller driven small airplanes. These requirements would be specified in a new § 36.501. The technical details of the proposed noise standards would be contained in proposed Appendix F (discussed below) which would be incorporated by reference in § 36.501.

Paragraph (c) of § 36.501 would except agricultural and fire fighting airplanes from the otherwise applicable noise limits of Part D of Appendix F (but not from the noise measurement and correction requirements of Parts B and C of that appendix or the requirement to furnish noise levels under § 36.1501), provided that a noise abatement operating limitation is furnished under proposed new § 36.1583(c). Specifically, § 36.501 (c) excludes airplanes designed for "agricultural aircraft operations" as defined in § 137.3 of Part 137, Agricultural Aircraft Operations, as effective on January 1, 1966. Under § 137.3, "agricultural aircraft operations" means "the operation of an aircraft for the purpose of (1) dispensing any economic poison, (2) dispensing any other substance intended for plant nourishment, soil treatment, propagation of plant life, or pest control, or (3) engaging in dispensing activities directly affecting agriculture, horticulture, or forest preservation, but not including the dispensing of live insects." The "dispensing" aspect is the basis for the cross reference of § 137.3 in this proposal since "dispensing" involves the carrying of loads and may involve low altitude maneuvering at high weights with minimum reserves of power. This same reasoning is also the basis for the exclusion of airplanes designed for "dispensing fire fighting materials." Even though an airplane might be suited to certain agricultural or fire control operations that do not involve dispensing activities (such as surveying crop damage or searching for forest fires), this proposal does not intend to exclude that airplane unless it is also designed for the dispensing operations discussed above.

The reasons for excluding agricultural and fire fighting airplanes from this proposal include (1) the strong public interest served by operation of these airplanes; (2) the frequent need of these airplanes to use all available engine power to carry large loads, near the extremes of the airplanes' load carrying and maneuvering abilities, at low altitudes; (3) the resulting unacceptable tradeoffs between safety and noise reduction that may occur in some airplane types used for agricultural or fire fighting operation if the available power were reduced by the installation of mufflers or other devices in order to meet the noise standards proposed herein; and (4) the fact that imposition of less restrictive noise standards on these airplanes would not result in enough public benefit to justify imposing the costs of compliance on the manufacturers of those airplanes.

In order to ensure that the exclusion of agricultural and fire fighting airplanes does not create a class of noise-exempt

airplanes operating without FAA control with respect to noise impact, it is proposed to require, through the use of an operating limitation on the type design itself, that (if the airplane does not comply with the noise prescribed in Part D of Appendix F) the airplane not be operated, for any purpose (not only the agricultural or fire fighting purpose) except in compliance with a current noise abatement flight plan and route approved by the FAA and issued to the operator. This operating limitation would be issued under proposed § 36.1583 (c). The effect of this provision is to provide a choice between compliance with the noise limit in Part D of Appendix F and imposition of the operating limitation.

The proposed changes to § 36.1581 reflect the fact that some small airplanes that would be covered by this proposal are not required to have an Airplane Flight Manual (unlike the airplanes now covered by Part 36). For these airplanes, the proposed changes would permit the required noise data and information to be furnished either in the approved portion of an Airplane Flight Manual (if desired by the applicant) or in any combination of approved manual material, markings, and placards.

Proposed new § 36.1583 would contain all noise related operating limitations issued as part of the certification process under Part 36. Paragraph (a) repeats the statement, now in § 36.1581(a), that no operating limitations are issued under Part 36 except those specified. This precludes any inference that the operating procedures used to comply with Part 36 have been determined to be the best for any particular airport noise problem and to prevent any inference that Part 36 requires these procedures to be complied with by aircraft operators. Except as discussed above with respect to noncomplying agricultural and fire fighting airplanes, noise abatement operating requirements will be issued and amended, when appropriate, under the flexible procedures for directly amending the operating rules (such as Part 91 of the Federal Aviation Regulations) rather than indirectly by taking action to amend the operating limitations of individual airplane types established during certification. Paragraph (a) also reflects the fact that certain small airplanes are not required (under the airworthiness rules) to have Airplane Flight Manuals. That paragraph thus provides that the required operating limitations must be furnished in the form and manner prescribed for operating limitations in the applicable airworthiness regulations. Proposed § 36.1583(b) broadens the reference to weight limits beyond the current limitation to "takeoff or landing noise" (see § 36.1581(b)). This reflects the fact that new Appendix F would yield flyover noise levels rather than takeoff or landing (approach) noise levels.

As discussed above, proposed § 36.1583 (c) contains the noise abatement operating limitation prescribed for applicants who elect not to comply with the prescribed noise limits for agricultural and fire fighting airplanes.

IV. *Proposed Appendix F.* As stated above, the detailed noise measurement, data correction, and noise limit requirements for propeller driven small airplanes would be contained in a new Appendix F to Part 36. Part B of the new appendix would contain noise measurement provisions, including test site and atmospheric conditions; noise measurement system requirements; requirements for sensing, recording, reporting, and approval of noise data; and flight procedures that must be complied with during the noise test.

Section F36.101 would contain test area (site) and atmospheric condition requirements similar to those in section A36.1(b)(2) and (c) of current Appendix A of Part 36. Section F36.103 would contain acoustical measurement system requirements similar to those in section A36.2(b)(1) of Appendix A. Note that FAA approval of acoustical measurement equipment would be required. Section F36.105 would contain requirements covering the sensing, recording, and reproducing of acoustical data. Proposed section F36.105(b) would incorporate, by reference, International Electrotechnical Commission (IEC) Publication No. 179. Proposed section F36.105 contains three differences from section A36.2(c) of Appendix A that are believed to be appropriate to the noise characteristics of propeller driven small airplanes. Thus, section F36.105(e) requires that, if requested by the Administrator, the recorded noise signal be read through an "A" filter in order to substantiate that the levels read directly on the precision sound level meter are correct. Section A36.2(d) delineates the electronic calibration procedures for the analysis equipment and requires one-third octave band analysis to obtain EPNdB values. As the one-third octave band analysis is not needed to obtain dB(A) levels, the more detailed electronic calibration has been deleted. When analysis of the tape recording is required by the Administrator, the applicant will submit his method of equipment calibration to the FAA for approval. Also, windscreen insertion losses for the predominant frequencies produced by propeller driven small airplanes are believed to be negligible. Therefore, no correction for such losses is provided.

Section F36.107 would contain noise measurement procedures similar to those in section A36.2(e) with one difference: Section F36.107, unlike section A36.2(e)(3), does not contain a requirement to supplement field calibration with the use of an insert voltage device to place a known signal at the input of the microphone. It is believed that this additional requirements is not needed to ensure adequate measurement accuracy with respect to the noise of propeller driven small airplanes.

Section F36.109 would contain data recording, reporting, and approval requirements similar to requirements in § A36.3 with deviations reflecting the use of dB(A), rather than EPNdB (as in § A36.3), and deviations needed to achieve simplicity where consistent with the level of accuracy that is required.

Section F36.111 would contain flight procedures believed to be appropriate to the single-point measurement concept that is proposed for propeller driven small airplanes.

Part C of Appendix F would contain requirements concerning the correction of noise data obtained under Part B of the Appendix and requirements concerning the validity of the results obtained from that data. Unlike Appendix A of Part 36, section F36.201 would provide for a range of atmospheric conditions within which no correction of data to acoustic standard day conditions is required. This reflects the flat response of atmospheric attenuation for the frequencies dominating the noise signatures of propeller driven small airplanes. Section F36.201 would also contain a performance correction methodology intended to penalize airplanes with poor climb performance and give credit to airplanes with good climb performance. This reflects the importance of good climb performance in removing the airplane as a noise source from the airport environs as rapidly as possible.

Section F36.301 would contain the noise limits, and related compliance dates, for the type and airworthiness certification of propeller driven small airplanes. In brief outline, this section would have the following effects:

(1) On and after the date of publication of this Notice of Proposed Rule Making, all new applications for type certification for propeller driven small airplanes would be subject to the noise standards in paragraph (b) of section F36.301. This would prevent a manufacturer from escaping noise standards by the mere filing of an application under Part 21. However, the type certification noise standards would not apply retroactively to type certificates issued before the effective date of the final regulation.

(2) On and after January 1, 1975, new application for type certification would be subject to the noise standards in paragraph (c) of section F36.301. These standards are more restrictive than those in paragraph (a) for airplanes whose weights are from 3,300 to 12,500 lbs., inclusive.

(3) On and after January 1, 1980, no propeller-driven small airplane would be issued a standard airworthiness certificate or a restricted category airworthiness certificate (if it has not had "flight time" before that date) unless it is shown to comply with the noise limits in section F36.301(c). This would include airplanes produced under type certificates that comply with the less restrictive noise standards in section F36.301(b). The term "flight time" is used since there is no better single indicator of when an airplane's production is essentially complete, and since the term "flight time" is defined in Part 1 of the Federal Aviation Regulations. The date of application for

the airworthiness certificate would not be a controlling factor.

(4) Because of the "acoustical change" requirements (see discussion of § 36.1 (c)), the standards in section F36.301 would place noise ceilings on the issuance of all changes to type certificates for propeller driven small airplanes subject to the standards.

(5) Agricultural and firefighting airplanes would, as discussed above, be excluded from the noise limits in § F36.301 if they have the prescribed operating limitation (in which case they would also be excluded from the "acoustical change" provisions of § 36.1(c)).

V. *The proposed changes to Part 21.* Procedural amendments to Part 21 would be issued to support the above mentioned amendments to Part 36. Thus, the introductory clauses of §§ 21.17(a) and 21.101 (a) would be amended to be consistent with the fact that sections other than § 36.2 would be exceptions to the date-of-application provisions of §§ 21.17 and 21.101. The introductory clause of § 21.25 would also be amended to reflect the proposed requirement, in Part 36, that propeller-driven small airplanes meet those standards for type certification in the restricted category. Section 21.93 would be amended to contain the acoustical change provisions discussed above.

Section 21.115 would be amended to specifically incorporate the acoustical change provisions of Part 36 as conditions for the issuance of supplemental type certificates for airplanes covered by Part 36. This would conform § 21.115 to the currently effective acoustical change provisions of Part 36 and would apply to all airplanes covered by Part 36, not only propeller-driven small airplanes.

Section 21.183 would be amended to require compliance with "the applicable noise requirements of Part 36" for the issuance of a standard airworthiness certificate. The requirements would apply only to the first, or "original," airworthiness certificate. Import aircraft could (as is the case under § 21.29 for type certificates) qualify for a standard airworthiness certificate if the country of manufacture certifies, and the Administrator finds, that the airplane complies with either the applicable U.S. noise requirements or the Foreign noise requirements plus any other requirements that the Administrator prescribes to provide noise levels no greater than those resulting under the applicable U.S. regulations. For the reasons discussed above, agricultural and firefighting airplanes would be excepted if the prescribed operating limitation has been issued (see proposed § 36.1583(c)).

Section 21.257 would be amended to provide that no type certificate or amended type certificate may be issued under a delegation option authorization unless the Administrator finds that applicable noise requirements (including applicable acoustical change requirements, in the case of amended type certificates) are complied with. Similarly, § 21.451 would be amended to make it clear that, notwithstanding the designated alteration station authorization procedures of Subpart M of Part 21, no supplemental type certificate may be issued under that Subpart until compliance with applicable acoustical change requirements is found by the Administrator. The amendment to § 21.451 would make Subpart M of Part 21 consistent with Part 36 for all aircraft covered by a DAS authorization (not only propeller-driven small airplanes).

This amendment is proposed under the authority of sections 313(a), 601, 603, and 611 of the Federal Aviation Act of 1958 (49 U.S.C. 1354(a), 1421, 1423, and 1431), section 6(c) of the Department of Transportation Act (49 U.S.C. 1655(c)), title I of the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq.), and Executive Order 11514, March 5, 1970.

In consideration of the foregoing, it is proposed to amend Subchapter C of Chapter I of Title 14 of the Code of Federal Regulations as follows:

PART 21—CERTIFICATION PROCEDURES FOR PRODUCTION AND PARTS

A. Part 21 of the Federal Aviation Regulations would be amended as follows:

1. Section 21.17(a) (introductory clause) would be amended to read as follows:

§ 21.17 Designation of applicable regulations.

(a) Except as provided in § 25.2 and in Part 36 of this Chapter, an applicant for a type certificate must show that the aircraft, aircraft engine, or propeller concerned meets—

* * * * *

2. Section 21.25(a) (introductory clause) would be amended to read as follows:

§ 21.25 Issue of type certificate: restricted category aircraft.

(a) An applicant is entitled to a type certificate for an aircraft in the restricted category for special purpose operations if he shows compliance with the applicable noise requirements of Part 36 of this Chapter, and if he shows that no feature or characteristic of the aircraft makes it unsafe when it is operated under the limitations prescribed for its intended use, and that the aircraft—

* * * * *

3. Section 21.93(b) would be amended to read as follows:

§ 21.93 Classification of changes in type design.

* * * * *

(b) For the purpose of complying with Part 36 of this chapter, any voluntary change in the type design of an airplane that may increase the noise levels of that airplane is an "acoustical change" (in addition to being a minor or major change as classified in paragraph (a) of this section) for the following airplanes:

(1) Subsonic transport category large airplanes.

(2) Subsonic turbojet powered airplanes (regardless of category).

(3) Propeller-driven small airplanes in the normal, utility, acrobatic, transport, and restricted categories (except for airplanes that are designed for "agricultural aircraft operations" as defined in § 137.3 of this chapter, as effective on January 1, 1966, or for dispensing fire fighting materials, and for which the operating limitation prescribed in § 36.1583(c) of this chapter is issued). For these airplanes, "acoustical changes" are limited to the following type design changes:

(i) Any change to, or removal of, a muffler or other component designed for noise control; and

(ii) Any change to, or installation of, a powerplant or propeller that increases maximum continuous power or thrust at sea level, or increases the propeller tip speed at that power or thrust, over that previously approved for the airplane.

4. Section 21.101(a) (introductory clause) would be amended to read as follows:

§ 21.101 Designation of applicable regulations.

(a) Except as provided in § 25.2 and Part 36 of this chapter, an applicant for a change to a type certificate must comply with either—

* * * * *

5. Section 21.115 (section heading and paragraph (a)) would be amended to read as follows:

§ 21.115 Applicable requirements.

(a) Each applicant for a supplemental type certificate must show that the altered product meets applicable airworthiness requirements as specified in paragraphs (a) and (b) of § 21.101 and, in the case of an acoustical change described in § 21.93(b), show compliance with the applicable noise requirements of § 36.1(c) of this chapter.

* * * * *

6. Section 21.183 would be amended by adding a new paragraph (e) to read as follows:

§ 21.183 Issue of standard airworthiness certificates for normal, utility, acrobatic, and transport category aircraft.

* * * * *

(e) *Noise requirements.* Notwithstanding all other provisions of this section, the following must be complied with for the issuance of a standard airworthiness certificate:

(1) (Reserved for separate regulatory action concerning newly produced turbojet engine powered airplanes and transport category airplanes pursuant to Notice 72-19, published in the FEDERAL REGISTER on July 25, 1972 (37 FR 14813)).

(2) For normal, utility, acrobatic, or transport category propeller driven small airplanes that have not had any flight time before the applicable date specified in Part 36 of the Federal Aviation Regulations, no standard airworthiness certificate is originally issued under this section unless the applicant shows that

the type design complies with the applicable noise requirements of Part 36 of this chapter in addition to the applicable airworthiness requirements in this section. For import aircraft, compliance with this paragraph is shown if the country in which the aircraft was manufactured certifies, and the Administrator finds, that the applicable requirements of Part 36 of this chapter (or the applicable aircraft noise requirements of the country in which the aircraft was manufactured and any other requirements the Administrator may prescribe to provide noise levels no greater than those provided by compliance with the applicable requirements of Part 36 of this chapter) and paragraph (c) of this section are complied with. This subparagraph does not apply to airplanes that are designed for "agricultural aircraft operations" as defined in § 137.3 of this chapter, as effective on January 1, 1966, or for dispensing fire fighting materials, and for which the operating limitation prescribed in § 36.1583(c) of this chapter is issued.

7. Section 21.185 would be amended by adding a new paragraph (d) to read as follows:

§ 21.185 Issue of airworthiness certificates for restricted category aircraft.

* * * * *

(d) *Noise requirements.* For propeller-driven small airplanes (except airplanes designed for "agricultural aircraft operations" as defined in § 137.3 of this chapter, as effective on January 1, 1966 or for dispensing fire fighting materials, and for which the operating limitation prescribed in § 36.1583(c) is issued) that have not had any flight time before the applicable date specified in Part 36 of this chapter, and notwithstanding the other provisions of this section, no original restricted category airworthiness certificate is issued under this section unless the Administrator finds that the type design complies with the applicable noise requirements of Part 36 of this chapter in addition to the applicable airworthiness requirements of this section. For import aircraft, compliance with this paragraph is shown if the country in which the aircraft was manufactured certifies, and the Administrator finds, that the applicable requirements of Part 36 of this chapter (or the applicable aircraft noise requirements of the country in which the aircraft was manufactured and any other requirements the Administrator may prescribe to provide noise levels no greater than those provided by compliance with the applicable requirements of Part 36 of this chapter) and paragraph (c) of this section are complied with.

8. Section 21.257 would be amended to read as follows:

§ 21.257 Type certificates—issue.

An applicant is entitled to a type certificate for a product manufactured under a delegation option authorization if the Administrator finds that the product meets the applicable airworthiness and noise requirements (including applicable acoustical change requirements in the case of amended type certificates).

9. A new § 21.451(d) would be added to read as follows:

§ 21.451 Limits of applicability.

* * * * *

(d) Notwithstanding any other provision of this subpart, no supplemental type certificate involving the acoustical change requirements of Part 36 of this chapter may be issued until the Administrator finds that those requirements are met.

PART 36—NOISE STANDARDS-AIRCRAFT TYPE CERTIFICATION

B. Part 36 of the Federal Aviation Regulations would be amended as follows:

1. Section 36.1 would be amended to read as follows:

§ 36.1 Applicability.

(a) This part prescribes noise standards for the issuance of type certificates and changes to type certificates, and for the issuance of certain airworthiness certificates, for the aircraft specified in paragraph (b) of this section.

(b) In addition to the applicable airworthiness requirements of this chapter, the following provisions of this part must be complied with by each person who applies under Part 21 of this chapter for the issuance of the following certificates:

(1) This subpart, and Subparts B, C, and G of this part must be complied with for the issuance of type certificates for subsonic transport category large airplanes and subsonic turbojet powered airplanes regardless of category.

(2) (Reserved for separate regulatory action concerning new production turbojet engine powered airplanes and transport category airplanes pursuant to Notice 72–19, published in the FEDERAL REGISTER on July 25, 1972 (37 FR 14813)).

(3) This subpart, and Subparts F and G of this part must be complied with for the issuance of—

(i) Type certificates for propeller driven small airplanes in the normal, utility, acrobatic, transport, and restricted categories; and

(ii) Standard airworthiness certificates and restricted category airworthiness certificates for propeller-driven small airplanes.

(c) Each person who applies under Part 21 of this chapter for an approval of an acoustical change described in § 21.93(b) of this chapter must show that the airplane meets the following requirements in addition to the applicable airworthiness requirements of this chapter:

(1) For subsonic transport category large airplanes and turbojet powered airplanes that can achieve the applicable noise limits prescribed in Appendix C of this part (or lower noise levels) prior to the change in type design, that appendix must be complied with. For airplanes that cannot achieve the applicable noise limits prescribed in Appendix C of this part prior to the change in type design, the noise levels created by the airplane prior to the change in type design, measured and evaluated as prescribed in Appendices A and B of this part, may not be exceeded.

(2) On or after January 1, 1975, for propeller-driven small airplanes in the normal, utility, acrobatic, transport, and restricted categories that can achieve the applicable noise limit prescribed in Appendix F of this part (or a lower noise level) prior to the change in type design, that limit may not be exceeded. For airplanes that cannot achieve the applicable noise limit prescribed in Appendix F of this part prior to the change in type design, the noise level created by the airplane prior to the change in type design, measured and corrected as prescribed in Parts B and C of Appendix F, may not be exceeded. For the purpose of this subparagraph, the "applicable noise limit prescribed in Appendix F" means—

(i) For airplanes type certificated under Appendix F prior to the type design change, the noise limit that was applied to that approval; and

(ii) For other airplanes, the noise limit prescribed in § F36.301(b).

2. The heading of Subpart B would be amended to read as follows:

Subpart B—Transport Category Large Airplanes and Turbojet Powered Airplanes

3. A new Subpart F would be added to read as follows:

Subpart F—Propeller-Driven Small Airplanes

§ 36.501 Noise limits.

(a) Compliance with this subpart must be shown for—

(1) Propeller-driven small airplanes for which application for the issuance of a type certificate in the normal, utility, acrobatic, transport, or restricted category is made on or after October 10, 1973; and

(2) Propeller-driven small airplanes for which application is made for the issuance of a standard airworthiness certificate or restricted category airworthiness certificate, and that have not had any flight time before January 1, 1980 (regardless of date of application).

(b) Compliance with this subpart must be shown with noise levels measured and corrected as prescribed in Parts B and C of Appendix F, or under approved equivalent procedures.

(c) For airplanes covered by this section, it must be shown that the noise level of the airplane is no greater than the applicable limit prescribed in Part D of Appendix F. This paragraph does not apply to airplanes that are designed for "agricultural aircraft operation" as defined in § 137.3 of this chapter as effective on January 1, 1966, or for dispensing fire fighting materials, and for which the operating limitation prescribed in § 36.1583(c) is issued.

4. Section 36.1581(a) would be amended to read as follows:

§ 36.1581 Manuals, markings, and placards.

For airplanes that are required to have an Airplane Flight Manual, the approved portion of that manual must contain the flight procedures, performance information, and noise levels approved under § 36.1501. For other airplanes, this data must be furnished in the approved portion of an Airplane Flight Manual or in any combination of approved manual material, markings, and placards.

5. A new § 36.1583 would be added to read as follows:

§ 36.1583 Operating limitations.

(a) Operating limitations prescribed in this section must be furnished in the form and manner prescribed for operating limitations in the applicable airworthiness regulations of this chapter. Except as provided in this section, no operating limitations are prescribed under this part.

(b) If a weight used in showing compliance with this part is less than a limiting weight established under the applicable airworthiness requirements of this chapter, that lesser weight must be furnished as an operating limitation.

(c) For airplanes that are designed for "agricultural aircraft operation" as defined in § 137.3 of this chapter as effective on January 1, 1966, or for dispensing fire fighting materials, and that do not comply with the noise limits in Part D of Appendix F, the following operating limitation, reading as follows, must be furnished:

This airplane does not comply with the applicable noise limits in Part 36 of the Federal Aviation Regulations and may not be operated, for any purpose, except in compliance with a current noise abatement flight plan and route approved by the FAA and issued to the operator.

6. A new Appendix F would be added to read as follows:

APPENDIX F—NOISE REQUIREMENTS FOR PROPELLER-DRIVEN SMALL AIRPLANES

PART A—GENERAL

SECTION F36.1 *Scope.* This appendix prescribes limiting noise levels, and procedures for measuring noise and correcting noise data, for propeller-driven small airplanes.

PART B—NOISE MEASUREMENT

SEC. F36.101 *General test conditions.* (a) The test area must be surrounded by relatively flat terrain having no excessive sound absorption characteristics such as those caused by thick, matted, or tall grass, by shrubs, or by wooded areas. No obstructions which significantly influence the sound field from the airplane may exist within a conical space above the measurement position, the cone being defined by an axis normal to the ground and by a half-angle 75° from this axis.

(b) The tests must be carried out under the following atmospheric conditions:

(1) There may be no precipitation;

(2) relative humidity may not be higher than 90 percent or lower than 30 percent;

(3) ambient temperature may not be above 86° F. or below 41° F. at 33′ above ground. If the measurement site is within 1 n.m. of an airport thermometer the airport reported temperature may be used;

(4) reported wind may not be above 10 knots at 33′ above ground. If wind velocities of more than 4 knots are reported, the flight direction must be aligned to within ±15° and flights with tail wind and head wind must be made in equal numbers. If the measurement site is within 1 n.m. of an airport anemometer, the airport reported wind may be used.

(5) There may be no temperature inversion or anomalous wind conditions that would significantly affect the noise level of the airplane when the noise is recorded at the required measuring point.

(6) The flight test procedures, measuring equipment, and noise measurement procedures must be approved by the FAA.

(7) Sound pressure level data for noise evaluation purposes must be obtained with acoustical equipment and measurement procedures that comply with sec. F36.103 of this appendix.

SEC. F36.103 *Acoustical measurement system.* The acoustical measurement system must consist of approved equipment equivalent to the following:

(a) A microphone system with frequency response compatible with measurement and analysis system accuracy as prescribed in sec. F36.105 of this appendix;

(b) tripods or similar microphone mountings that minimize interference with the sound being measured;

(c) recording and reproducing equipment characteristics, frequency response, and dynamic range compatible with the response and accuracy requirements of sec. F36.105 of this appendix;

(d) acoustic calibrators using sine wave or broadband noise of known sound pressure level. If broadband noise is used, the signal must be described in terms of its average and maximum root-mean-square (rms) value for nonoverload signal level.

SEC. F36.105 *Sensing, recording, and reproducing equipment.* (a) The noise produced by the airplane must be recorded. A magnetic tape recorder is acceptable.

(b) The characteristics of the system must comply with the recommendations in International Electrotechnical Commission (IEC) Publication No. 179 (as amended) concerning microphone and amplifier characteristics. The text and specifications of IEC Publication No. 179 (as amended) entitled "Precision Sound Level Meters" are incorporated by reference into this appendix and are made a part hereof as provided in 5 U.S.C. 552(a)(1) and 1 CFR Part 20. This publication was published in 1965 by the Bureau Central de la Commission Electrotechnique Internationale located at 1, rue de Varembe, Geneva, Switzerland, and copies may be purchased at that place. Copies of this publication are available for examination at the DOT Library, Federal Office Building 10A Branch and at the Office of Environmental Quality, both located at Headquarters, Federal Aviation Administration, 800 Independence Avenue, Washington, D.C. 20591. (Copies of this publication are available for examination at the Regional Offices of the FAA. A historic file will be maintained by the Office of Environmental Quality and will contain any changes made to this publication.)

(c) The response of the complete system to a sensibly plane progressive sinusoidal wave of constant amplitude must lie within the tolerance limits specified in IEC Publication No. 179 (as amended), over the frequency range 45 to 11,200 Hz.

(d) If limitations of the dynamic range of the equipment make it necessary, high frequency pre-emphasis must be added to the recording channel with the converse de-emphasis on playback. The pre-emphasis must be applied such that the instantaneous recorded sound pressure level of the noise signal between 800 and 11,200 Hz does not vary more than 20 dB between the maximum and minimum one-third octave bands.

(e) If requested by the Administrator, the recorded noise signal must be read through an "A" filter as defined in IEC Publication No. 179 (as amended). The output signal from the filter must be fed to a rectifying circuit with square law rectification, integrated with time constants for charge and discharge of about 1 second or 800 milliseconds.

(f) The equipment must be acoustically calibrated using facilities for acoustic free-field calibration and if analysis of the tape recording is requested by the Administrator, the analysis equipment shall be electronically calibrated by a method approved by the FAA.

(g) A windscreen must be employed with the microphone during all measurements of aircraft noise when the wind speed is in excess of 6 knots.

SEC. F36.107 *Noise measurement procedures.* (a) The microphone must be oriented in a known direction so that the maximum sound received arrives as nearly as possible in the direction for which the microphones are calibrated. The microphone sensing elements must be approximately 4′ above ground.

(b) Immediately prior to and after each test, a recorded acoustic calibration of the system must be made in the field with an acoustic calibrator for the two purposes of check-in system sensitivity and providing an acoustic reference level for the analysis of the sound level data.

(c) The ambient noise, including both acoustical background and electrical noise of the measurement systems, must be recorded and determined in the test area with the system gain set at levels that will be used for aircraft noise measurements. If aircraft sound pressure levels do not exceed the background sound pressure levels by at least 10 dB(A), approved corrections for the contribution of background sound pressure level to the observed sound pressure level must be applied.

SEC. F36.109 *Data recording, reporting, and approval.* (a) Data representing physical measurements or corrections to measured data must be recorded in permanent form and appended to the record except that corrections to measurements for normal equipment response deviations need not be reported. All other corrections must be approved. Estimates must be made of the individual errors inherent in each of the operations employed in obtaining the final data.

(b) Measured and corrected sound pressure levels obtained with equipment conforming to the specifications described in sec. F36.105 of this appendix must be reported.

(c) The type of equipment used for measurement and analysis of all acoustic, airplane performance, and meteorological data must be reported.

(d) The following atmospheric environmental data, measured immediately before, after, or during each test at the observation points prescribed in sec. F36.101 of this appendix must be reported:

(1) Air temperature and relative humidity;

(2) maximum, minimum, and average wind velocities.

(e) Comments on local topography, ground cover, and events that might interfere with sound recordings must be reported.

(f) The following airplane information must be reported:

(1) Type, model and serial numbers (if any) of airplanes, engine(s), and propeller(s);

(2) Any modifications or nonstandard equipment likely to affect the noise characteristics of the airplane;

(3) maximum certificated takeoff weights;

(4) airspeed in knots for each overflight of the measuring point;

(5) engine performance in terms of revolutions per minute and other relevant parameters for each overflight; and

(6) aircraft height in feet determined by a calibrated altimeter in the aircraft, approved photographic techniques, or approved tracking facilities.

(g) Aircraft speed and position and engine performance parameters must be recorded at an approved sampling rate sufficient to insure compliance with the test procedures and conditions of this appendix.

SEC. F36.111 *Flight procedures.* (a) Tests to demonstrate compliance with the noise level requirements of this appendix must include at least four level flights over the measuring station at a height of 1,000' ±30' and ±10° from the zenith when passing overhead.

(b) Overflight must be performed at rated maximum continuous power, stabilized speed with propellers synchronized and with the airplane in the cruise configuration except that, if the speed at maximum continuous power would exceed the maximum speed authorized in level flight, accelerated flight is acceptable.

PART C—DATA CORRECTION

SEC. F36.201 *Correction of data.* (a) Noise data obtained when the temperature is outside the range of 68° F. ± 9° F., or the relative humidity is above 90 percent or below 40 percent, must be corrected to 77° F. and 70 percent relative humidity by a method approved by the FAA.

(b) The performance correction prescribed in paragraph (c) of this section must be used. It must be determined by the method described in this appendix, and must be added algebraically to the measured value. It is limited to 5 dB(A).

(c) The performance correction must be computed by using the following formula:

$$\Delta \text{ dB} = 60 - 20 \log_{10} \left\{ \frac{(11{,}430 - D_{50})}{} \frac{R/C + 50}{V_y} \right\}$$

Where:

D_{50} = Takeoff distance to 50 feet at maximum certificated taffeoff weight.

R/C = Certificated best rate of climb (fjm).

V_y = Certificated best rate of climb (fpm). ing to certificated best rate of climb, both being given in the same units.

(d) When takeoff distance to 50' is not listed as approved performance information, the figures of 1375' for single-engine airplanes and 1600' for multi-engine airplanes must be used.

SEC. F36.203 *Validity of results.* (a) The test results must produce an average dB(A) and its 90 percent confidence limits, the noise level being the arithmetic average of the corrected acoustical measurements for all valid test runs over the measuring point.

(b) The samples must be large enough to establish statistically a 90 percent confidence limit not exceeding ±1.5 dB(A). No test result may be omitted from the averaging process, unless omission is approved by the FAA.

PART D—NOISE LIMITS

SEC. F36.301 *Aircraft noise limits.* (a) Compliance with this section must be shown with noise data measured and corrected as prescribed in Parts B and C of this appendix.

(b) For airplanes for which application for a type certificate is made on or after (date of publication of this NPRM in the FEDERAL REGISTER), the noise level must not exceed 68 dB(A) up to aircraft weights of 1,320 pounds (600 kg.). From 1,320 pounds to 3,630 pounds (1,650 kg.) the limit increases at the rate of 1 dB/165 pounds (1 dB/75 kg.) up to 82 dB (A) at 3,630 pounds, after which it is constant at 82 dB(A) up to and including 12,500 pounds. However, airplanes produced under type certificates covered by this paragraph must also meet paragraph (d) of this section for the original issuance of standard airworthiness certificates or restricted category airworthiness certificates if those airplanes have not had flight time before the date specified in that paragraph.

(c) For airplanes for which application for a type certificate is made on or after January 1, 1975, the noise levels may not exceed the noise limit curve prescribed in paragraph (b) of this section, except that 80 dB(A) may not be exceeded at weights from and including 3,300 pounds to and including 12,500 pounds.

(d) For individual airplanes for which application is made for a standard airworthiness certificate or for a restricted category airworthiness certificate, and that have not had any flight time before January 1, 1980, the requirements of paragraph (c) of this section apply, regardless of date of application, to the original issuance of the certificate for that individual airplane.

(e) This section does not apply to airplanes that are designed for "agricultural aircraft operation" as defined in § 137.3 of this chapter as effective on January 1, 1966, or for dispensing fire fighting materials, and for which the operating limitation prescribed in § 36.1583(c) is issued.

Issued in Washington, D.C. on October 9, 1973.

RICHARD P. SKULLY,
Director, Office of Environmental Quality.

[FR Doc.73-21616 Filed 10-9-73;11:31 am]

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